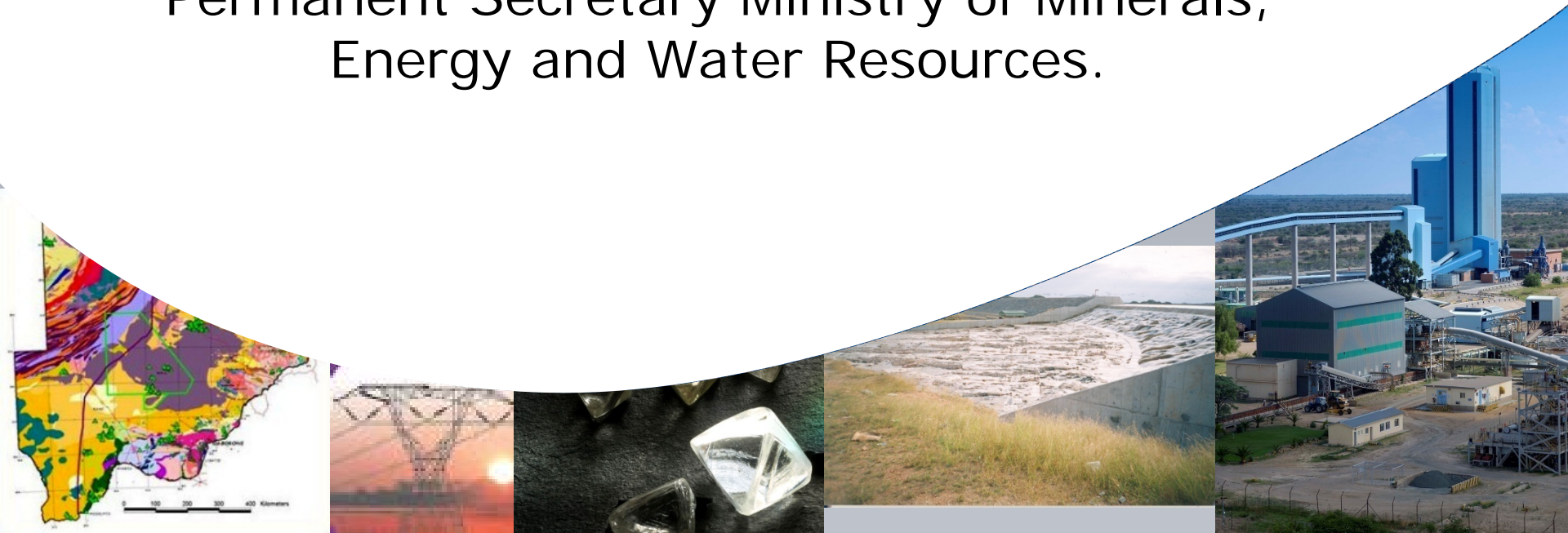




Republic of Botswana

# THE COAL ROAD MAP PITSO – “An Overview of the Botswana’s Coal Resources and Future Plans”

By Boikobo Paya,  
Permanent Secretary Ministry of Minerals,  
Energy and Water Resources.



# *Outline*

- ❖ Mineral Policy
- ❖ Background
- ❖ General Geology of Coal Bearing Areas
- ❖ Botswana's Coal Resources / Reserves & Spatial Distribution
- ❖ Botswana's Coal Qualities
- ❖ Findings of the Study
- ❖ Strategic Initiatives
- ❖ The Future is Coal
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- ❖ Conclusions
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# ***Minerals Policy Objectives***

1. Maximize the economic benefits for the nation while enabling private investor to earn competitive returns.
2. Create a competitive environment to stimulate private sector investment in mineral exploration and exploitation.
3. Encourage linkages with the rest of the economy to expand value addition activities.
  - Where economically feasible beneficiation and downstream activities should be done in Botswana to facilitate diversification, e.g diamonds, and we should look at other minerals
  - Companies should encourage suppliers to manufacture consumables such as reagents and equipment spares locally.
4. Generate employment and training for Botswana's citizens
5. Safeguard the environment

# ***Background***

- Botswana is heavily reliant on diamond revenues for her socio-economic development
- Diamond revenues are expected to dip significantly around the year 2022 when Jwaneng Mine (the jewel in the crown) is due to convert from open pit to underground mining
- Additional sources of revenues are required beyond diamonds to sustain the socio-economic development of the country

# ***Background***

- Botswana has extensive, and largely unexploited, coal resources which when developed can form part of the Government's effort to diversify the economy.
- Known coal resources in Botswana are of the order of 202 billion tonnes
- Current coal mine (Morupule Colliery) expanded to produce about 3.0 million tonnes per annum is insignificant in comparison to these resources endowment
- The demand for coal-for-energy has increased significantly nationally, regionally and internationally
- There is also potential to produce coal based products from Botswana coal

# ***Background***

- These abundance of coal resources constitute a strength that the country should leverage on.
- Therefore, the Government of Botswana has a duty to create a vision for resource exploitation for the maximum benefit to the nation.
- However, the exploitation of these coal resources requires to be done in a sustainable manner with due regard to the economic, social and environmental factors.
- Hence the GoB's decision to develop a national strategy on coal development that will constitute a blueprint for the orderly, timely and beneficial exploitation of the coal resources, namely the "**COAL ROADMAP**"

# ***Background***

- The Project is intended to formulate a Strategic Roadmap for the development of Botswana Coal and Coalbed Methane Resources as the exploitation of these resources are critical to:
  - Meeting the socio-economic and energy needs of the country
  - As well as the diversification of the economy from heavy reliance on diamonds
- The project is executed into three(3) phases with:
  - **Phase I:** Literature Review and detailed Project Planning
  - **Phase 2:** Technical Studies (resource assessment and evaluation, and related studies, etc), to be completed March 2013
  - **Phase 3:** Techno-Economic Evaluation (Development Options Evaluation and Selection) (2012 – 2014)
- Phase I was completed in November 2011.

# ***Background***

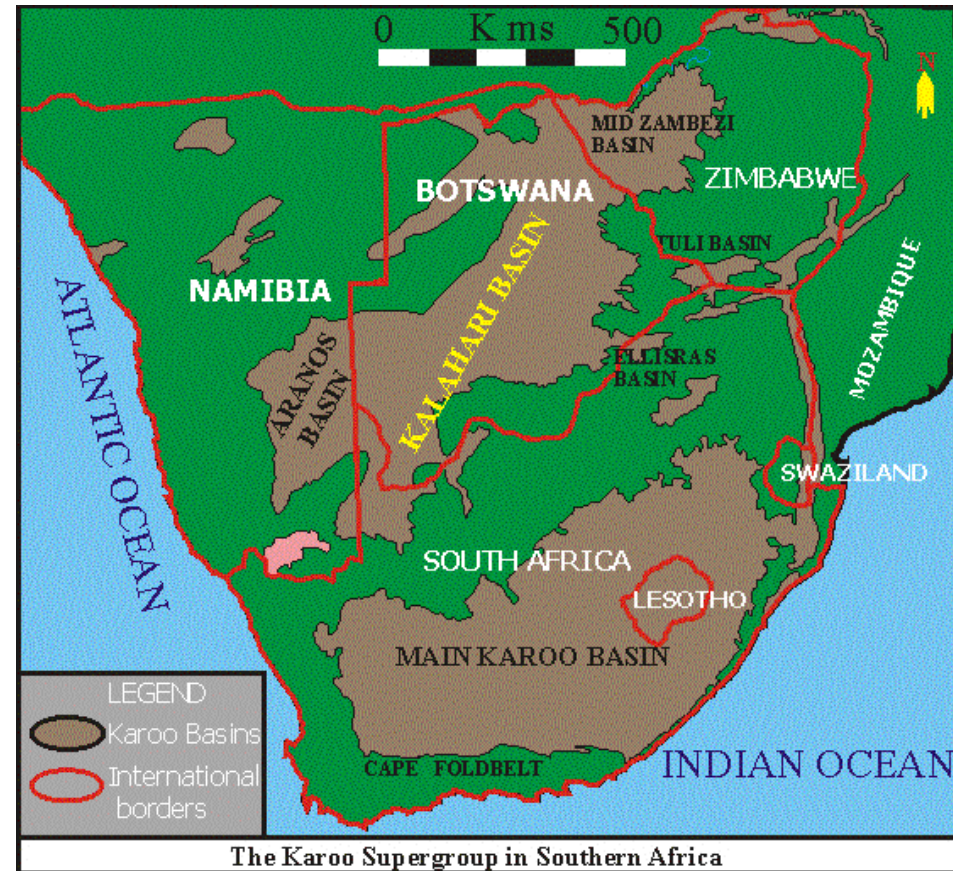
**The objective of the study was to:**

- Review all the relevant information on Botswana coal resources with the aim to advise on how to better utilize the country's coal resources now and in the future by developing an approximate schedule of coal production for multiple uses, and provide Government with a current and future market forecast for coal and its by-products in order to maximise their economic benefit;
- Conduct Market Analysis to come up with current and projected future coal demand, its usage and its associated by-products;
- Develop an options study to review the options that exist for development of the country's coal resources;
- Identify potential candidates capable of implementing the preferred strategic options, formulate a high-level implementation plan for resource development and define the scope of work for implementation of the preferred strategy.



# General Geology of Coal Bearing Areas

- ☐ All known Botswana coal deposits occur in the Karoo SuperGroup.
  - ✓ Which covers ~70% of the country.
- ☐ Drilling for coal was carried out as early as 1897,
- ☐ But after 1900 little attention appears to have been paid to the coal although its potential importance was referred to from time to time.



# Botswana's coal resources/ reserves and spatial distribution

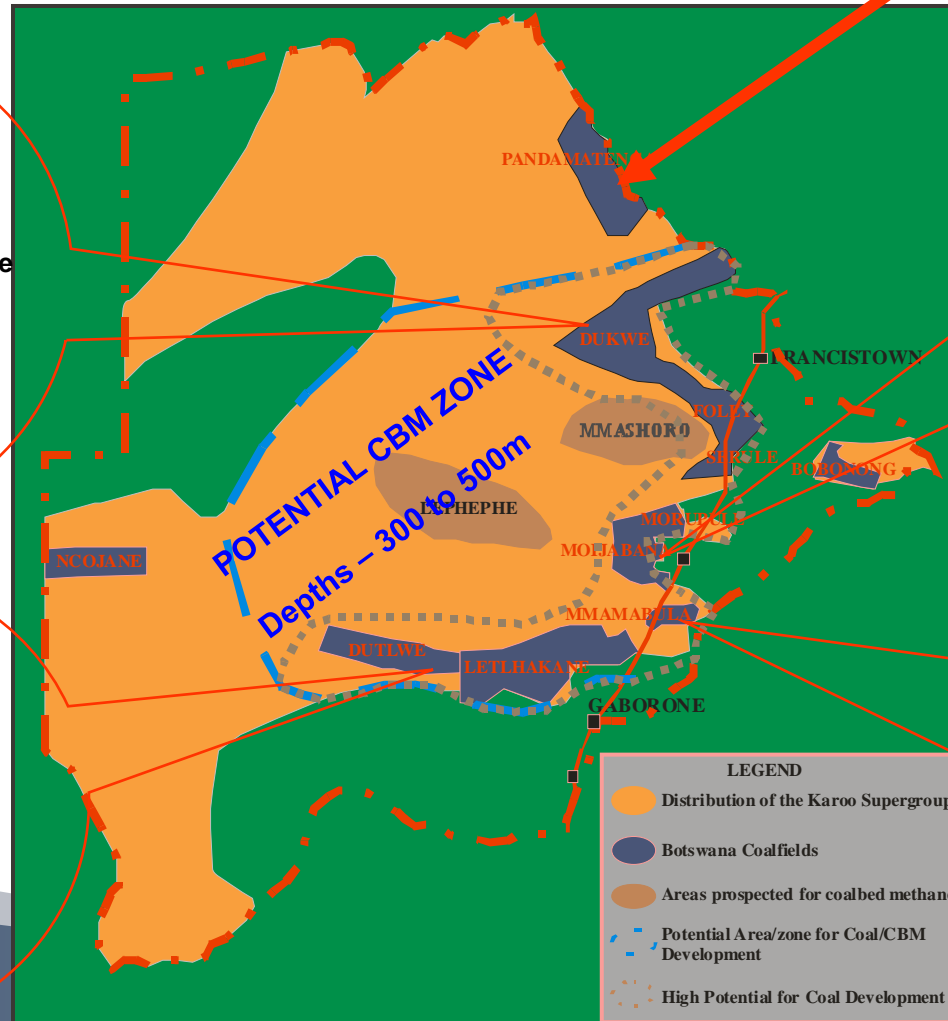
- ❑ Botswana is endowed with significant coal resources which has been explored by a number of companies as far back as the 50's (see figure)

## Eastern Coalfields:

- ✓ Potential for large resources, Currently little activities
- ✓ Inferred - 17809 (Mt)
- ✓ Indicated - 339 (Mt)
- ✓ Measure - ?

## South Eastern Coalfield :

- ✓ Potential for large resources, Currently not well explored!
- ✓ Inferred - 132810 (Mt)
- ✓ Indicated - 9283 (Mt)
- ✓ Measured - None?



Too Deep , Over 600m cover,  
Coking coal potential????

## Morupule Coalfield :

- ✓ Large resources, Export quality after beneficiation
- ✓ Inferred - 15574 (Mt)
- ✓ Indicated - 2706 (Mt)
- ✓ Measured - 2846 (Mt)

On-going exploration

## Mmamabula Coalfield:

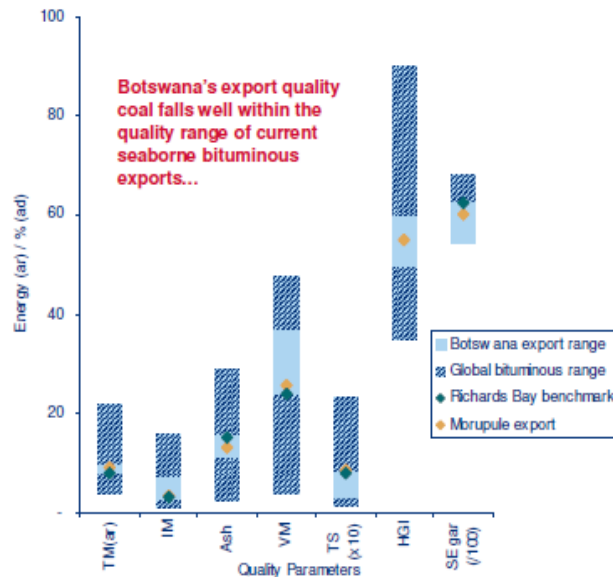
- ✓ Large resources, Export quality after beneficiation
- ✓ Inferred - 5005 (Mt)
- ✓ Indicated - 20215 (Mt)
- ✓ Measured - 494 (Mt)

On-going Exploration

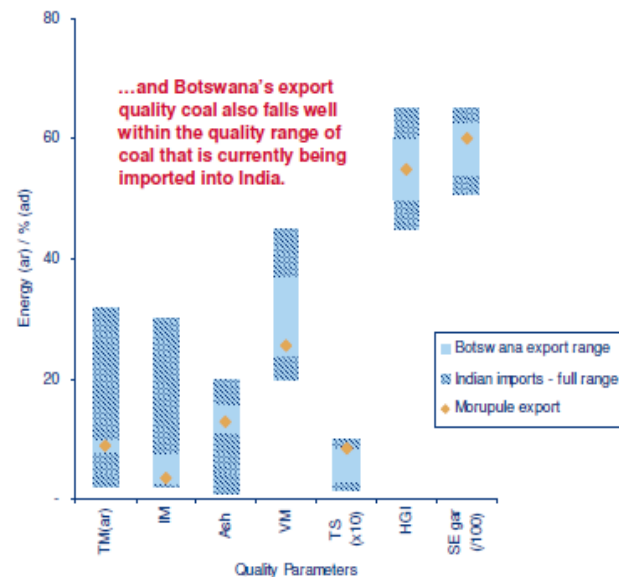
# ***Botswana Coal Qualities***

- The quality of Botswana's coal resources compares favourably with other coals available in the market and is suitable for export market as:
  - It is in-line with Indian requirements
  - Might also be accepted into Europe markets
  - Compares favourably with South African Export

Quality range – global seaborne bituminous exports



Quality range – Indian imports



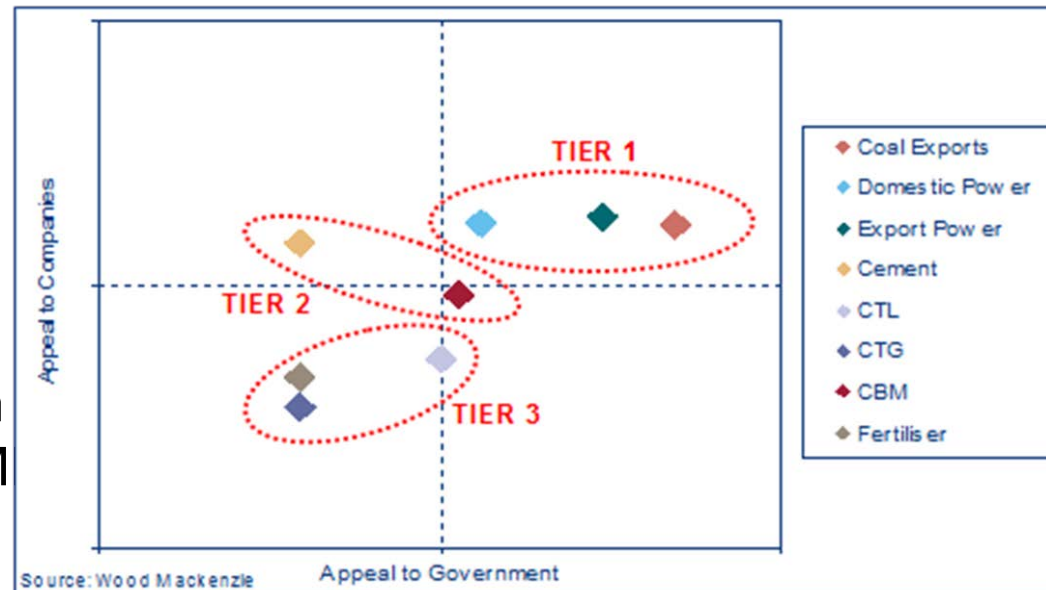
# Comparison of Botswana coal qualities against well-known reference brands.

- ❑ The quality of Botswana coal falls well within the range of current global seaborne bituminous exports.

Comparison of the quality of Botswana coals against well-known reference brands.				
	Botswana (High)	Botswana (Low)	Newcastle Benchmark	Richards Bay Benchmark
Energy kcal/kg	6, 000	5, 400	6, 322	6,300
Total moisture % (ar)	8	10	15 (max)	15 (max)
Inherent moisture % (ad)	4	5		
Ash % (ad)	13	20	14 (max)	16 (max)
Fixed carbon (ad)	58	50		
Total sulphur % (ad)	0.45	0.8	<0.75	<1.0

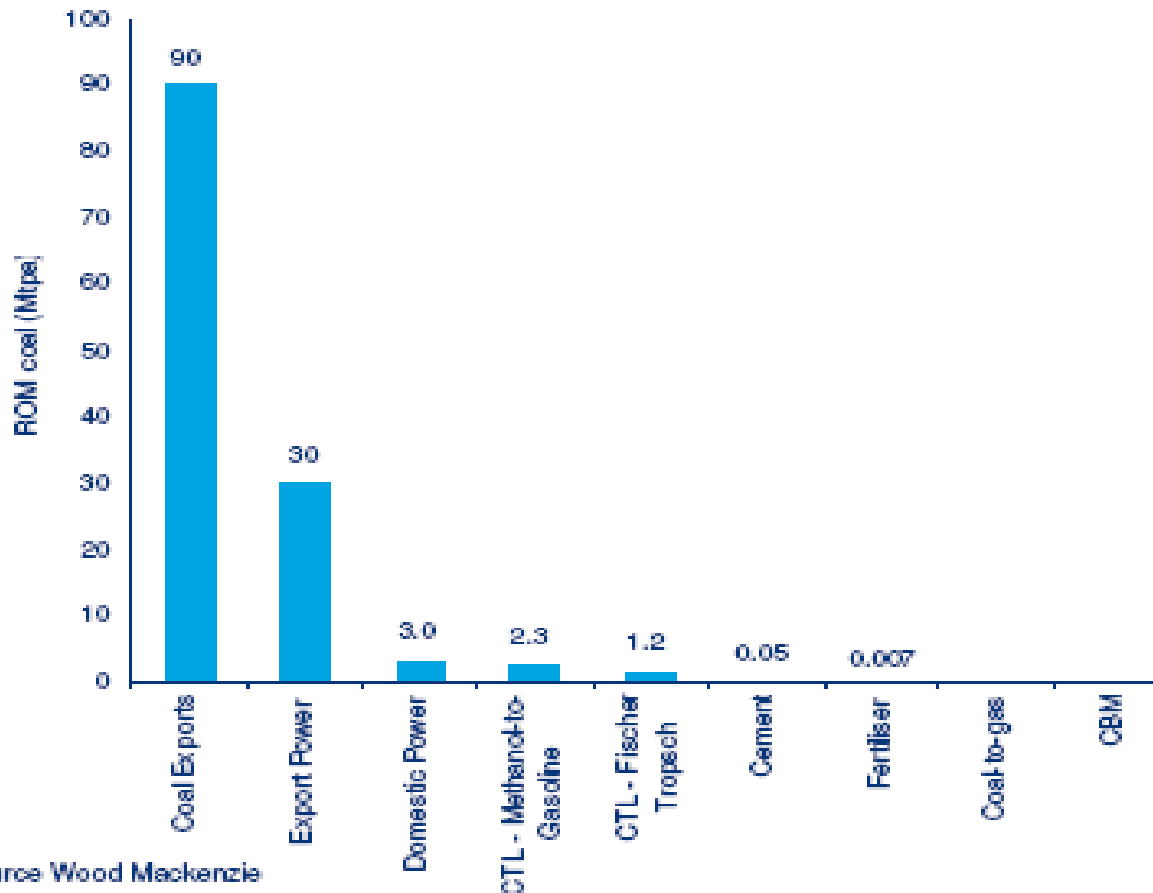
# ***Findings of the Study***

- Coal exports – Exporting coal into the seaborne market;
- Domestic power – Using coal to generate electricity for domestic consumption;
- Export power – Using coal to generate electricity for exports to other SADC countries;
- Coal-to-liquids – Producing liquid fuels from coal using the Fischer Tropsch and MTG processes;
- Coal-to-gas – Producing gas from coal for power generation and DM manufacture;
- Coal bed methane – Extracting CBM from gassy coal seams for power generation and LNG exports;
- Fertiliser - Producing nitrogen-based fertilisers from coal, etc.



# ***The Future is Coal – estimated amount of coal to be required***

Fig A1.1<sup>OS</sup>: Potential coal required per option



Source Wood Mackenzie



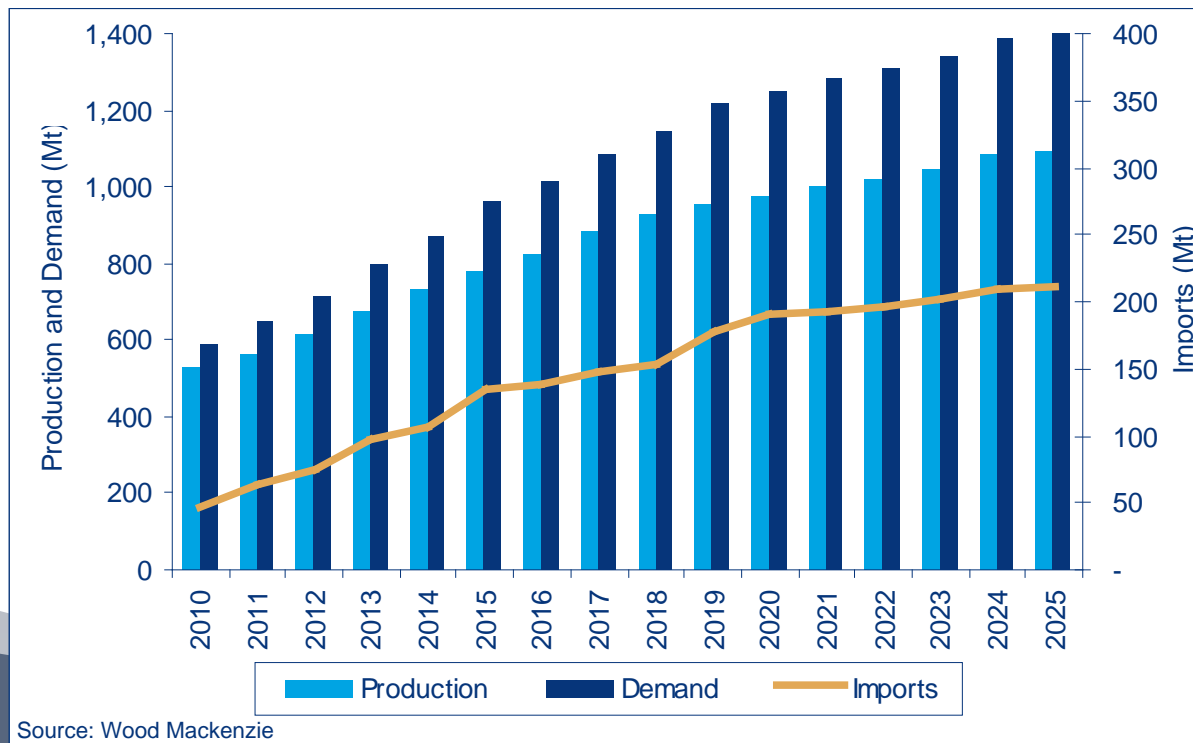
# SAPP DEMAND AND SUPPLY SITUATION

No.	Country	Utility	Installed Capacity [MW] As at Dec 2010	Available Capacity [MW] Dec 2010	Installed minus Available [MW]	2010 Peak Demand [MW]	Capacity Required [MW] 10.2% Reserve	Deficit (MW)
1	Angola	ENE	1 187	990	197	795		195
2	Botswana	BPC	202	190	12	553		-363
3	DRC	SNEL	2 442	1 170	1 272	1 081		89
4	Lesotho	LEC	72	72	-	121		-49
5	Malawi	ESCOM	287	287	-	274		13
6	Mozambique	EDM	233	174	59	546		-372
		HCB	2 075	2 075	-			2075
7	Namibia	NamPower	393	360	33	564		-204
8	South Africa	Eskom	44 170	41 074	3 096	36 970		4104
9	Swaziland	SEC	70	70	-	200		-130
10	Tanzania	TANESCO	1008	880	128	833		47
11	Zambia	ZESCO	1 812	1 215	597	1 600		-385
12	Zimbabwe	ZESA	2 045	1 320	725	2 029		-709

# ***Findings of the Study***

- The market studies concluded that the global demand for seaborne thermal coal will continue to grow strongly as domestic demand in a number of key countries outstrips supply.
- The growth in demand will be driven by the developing nations of Asia, especially China and India. Demand for seaborne thermal coal grew from 250 Mt in 1995 to 650 Mt by 2010, an annual growth rate of nearly 6.7%.

**Forecast Indian thermal coal imports**

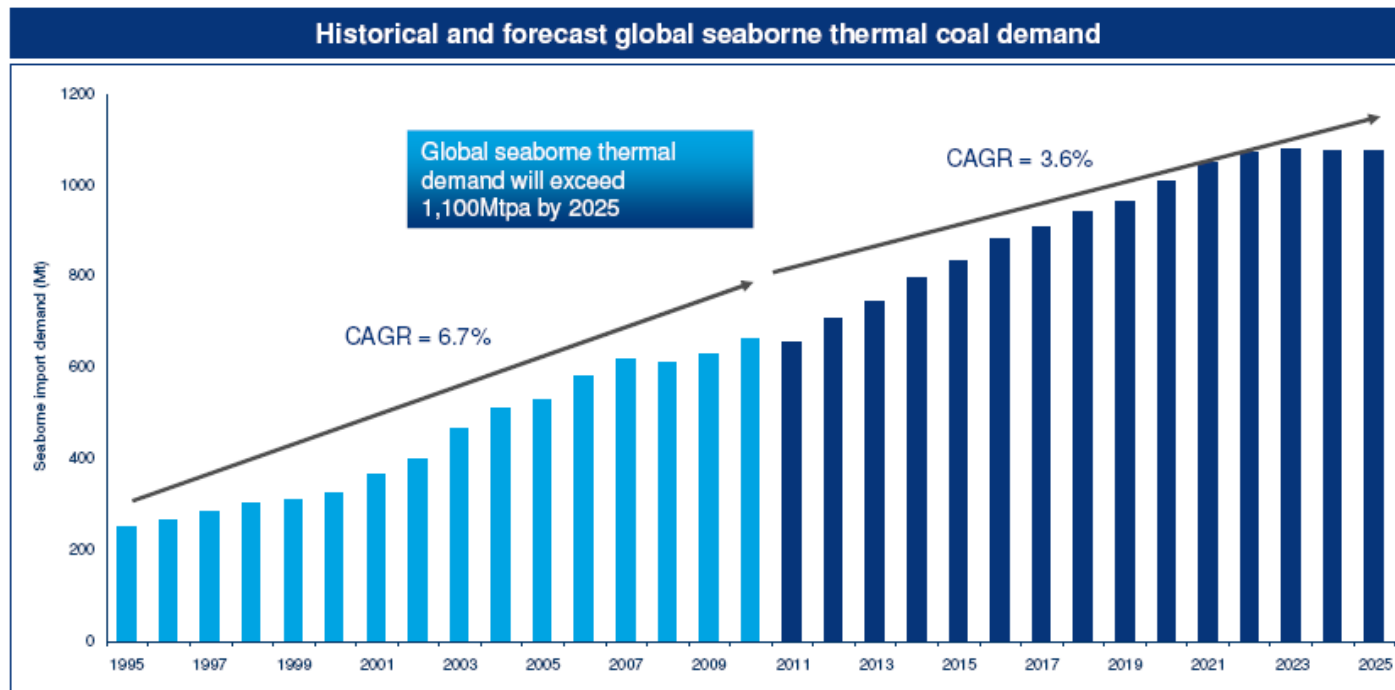




# ***Findings of the study***

- These growth is expected to continue, with demand reaching nearly 1,100 Mt by 2025.
- Europe will continue to be a large importer of coal but only limited growth in demand is expected.

**The seaborne thermal coal market will continue to grow substantially over the next fifteen years...**



# ***The Future is Coal – Best options for coal monetisation***

❖ Botswana has large, un-exploited coal resources

❖ Quality of Botswana's coal is suitable for export market

✓ It is in-line with Indian requirements

✓ Might also be accepted into Europe markets

❖ Compares favourably with South African Exports



# ***Findings of the Study***

- Seaborne thermal coal exports are currently dominated by five countries (Indonesia, Australia, Russia, Colombia, and South Africa).
- By 2020, these 5 countries will supply 90% of the seaborne trade. The source of the remaining 10% or about 100 million tonnes remains uncertain, it is unlikely that this 10% will come from currently producing basins, meaning that new coal provinces (such as Botswana, Mozambique) will need to be developed.

# ***Findings of the Study***

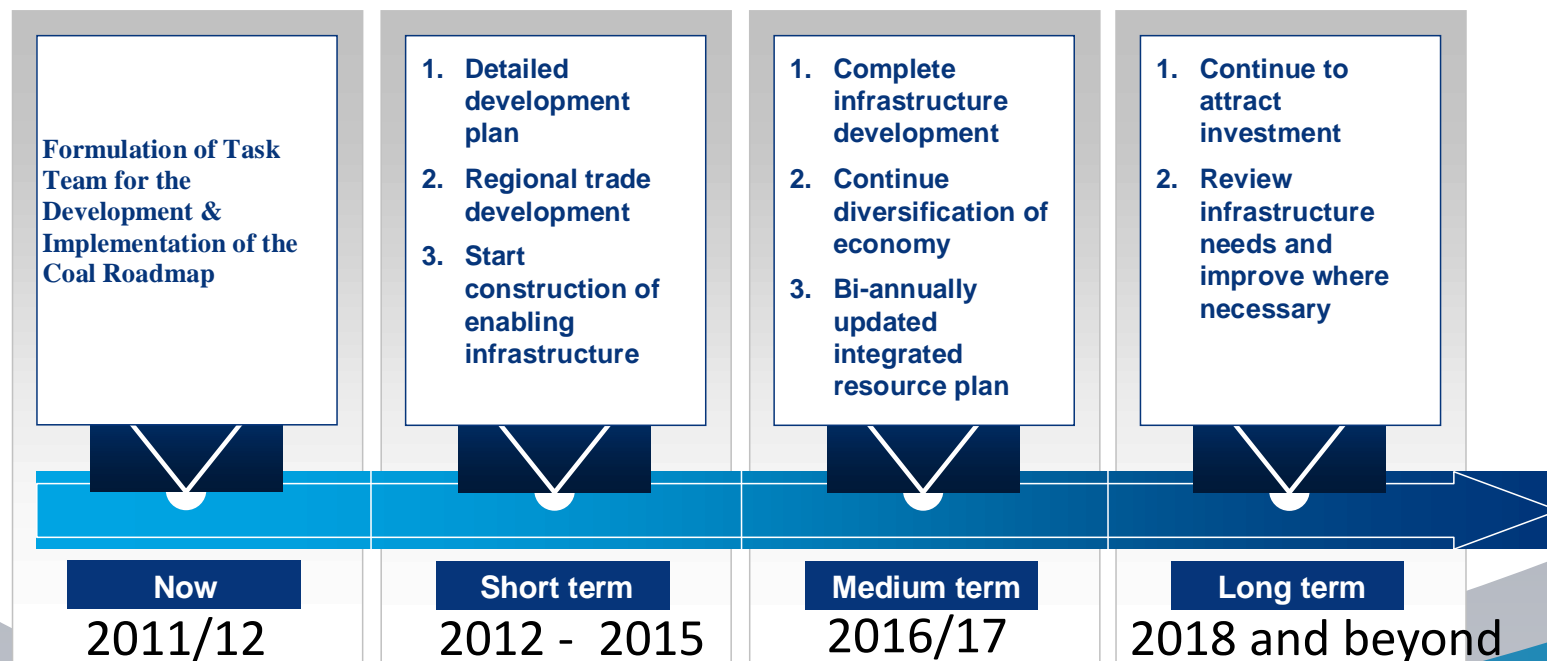
- Based on the above findings;
  - Coal exports, power exports and domestic power are considered the most attractive routes to monetising Botswana's coal resources, with clear synergies existing between the three.
  - CBM has a lot of potential but is simply not enough is known about the existing resource to classify it as a genuinely attractive option. Opportunities however exist for domestic peaking plants e.g. 90 MW plant at Orapa.

# ***Findings of the Study***

- Despite the apparent attractiveness of the Tier 1 options, large implementation challenges need to be overcome before Botswana can successfully monetise its coal resource.
- Given the tight timeframe and the plethora of possible actions, the Government needs to focus its efforts to ensure that its actions have the greatest possible positive impact on the local coal industry.
- This means focusing on areas over which the Government has control and where it can exert influence, and as such a high level implementation plan has been developed.

# ***Strategic roadmap to drive the development of the Botswana coal industry***

- Developing Botswana's coal industry will take time; considerable effort and energy. Not all of the actions suggested can be carried out by the government alone and identifying strategic partners to partner with for implementing aspects of the coal roadmap will be crucial to the ultimate success of the coal roadmap process.



# ***The Future is Coal - Immediate actions to drive coal development***

- ❖ Completing the development of the coal roadmap is crucial to provide a clear and transparent view of the government's intentions for the development of the coal industry.
- ❖ This will give investors more confidence around their long term strategy and implementation plans and will also enable investors to engage with the government more constructively with regard to on-going development of the industry.
- ❖ However beyond these immediate action, continued energy and drive will be required to sustain the momentum that will be created.

# ***The Future of Coal - Enabling Investment Climate***

- ❖ Therefore the setting up of a dedicated, independent task team / Force to manage the coal development process – “Coal Roadmap Development and Implementation” is a pre-requisite in:
  - Driving increased levels of exploration and providing certainty around infrastructure development and the regional power trade through:
  - Forming linkages of coal development in Botswana and infrastructure (rail, power stations, etc) development.



# ***Conclusions***

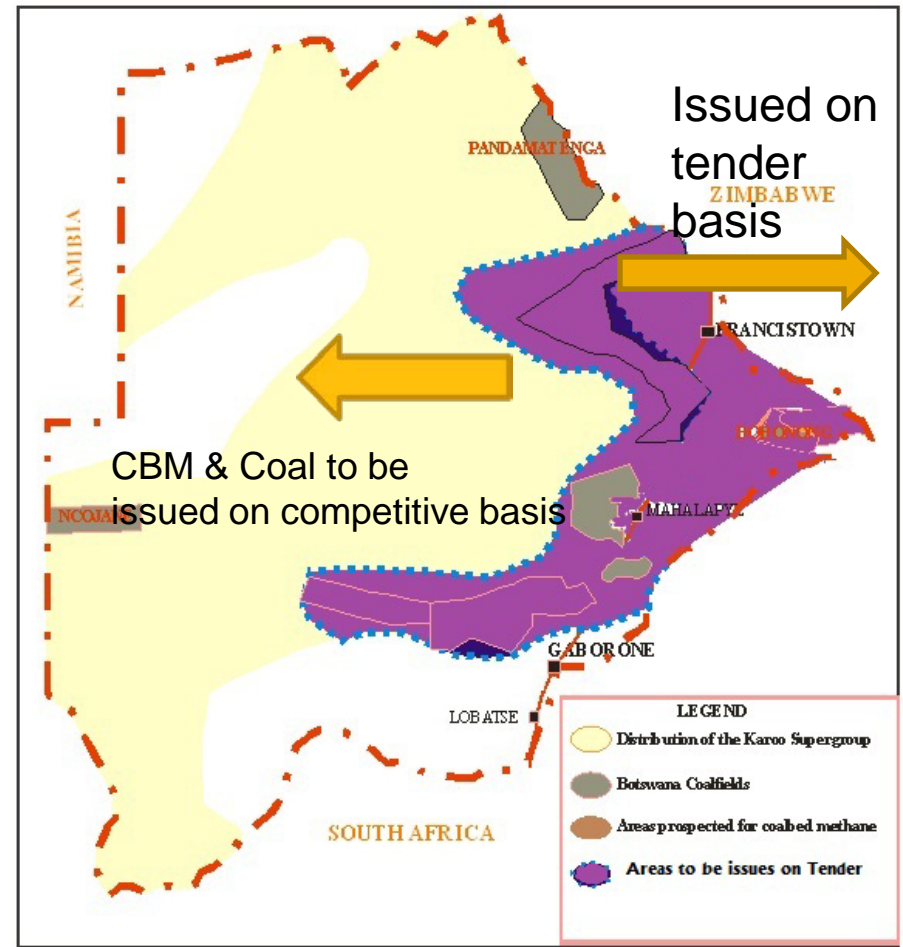
- ❖ Coal exports and power generation (for domestic use and export) are considered most attractive for the monetisation of the coal resource.
- ❖ The challenge is therefore for the Government of Botswana to do everything in its power to facilitate coal development for power generation and for export.
- ❖ The Coal Infrastructure Development plan is imperative
- ❖ Facilitation of the coal development and the rail development needs to be coordinated under one roof by a specialised and dedicated team.

## ***Way forward***

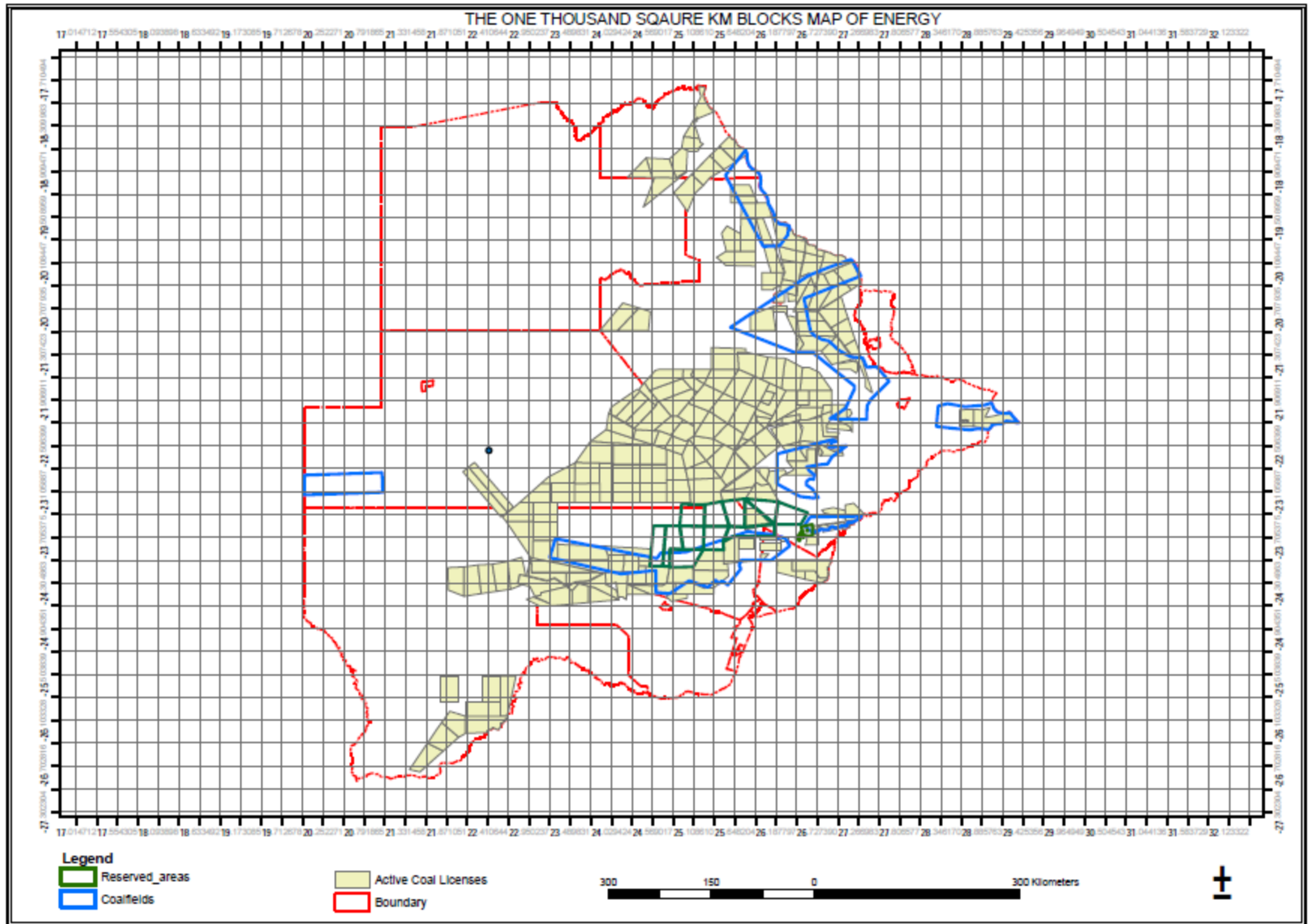
- ❖ Establish a dedicated Coal Coordinating unit by April 2012
- ❖ Extend the power grid to the North Western part of the Country to meet the demands from the upcoming new mines in the area and for regional interconnection (ZIZABONA). Feasibility study on the project to be completed by mid 2012.
- ❖ Development of a brownfield 300 MW IPP by 2015
- ❖ Development of a greenfield 300 MW IPP by 2018

# Way forward

- ❑ The Ministry is developing new licensing criteria for issuance of prospecting licence. The criteria will be sub divided into two;
  - ❑ Areas with good geological information will be issued on tendering basis, with the applicant offering the best exploration and development program issued the licence. The tenders will be made on blocks from the grid at regular intervals 6 – 8 months apart.
  - Currently developing terms of references for two areas (Mmamabula South and Central) Tender to be out by end of February, 2012
  - ❑ Areas with limited or no geological information will be issued on competitive basis.
- ❑ Existing concessions will not be affected.



# Way forward



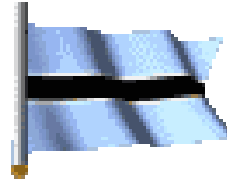
# *Way forward*

- To ensure the ground is developed as soon as possible, a more robust licence allocation process shall be developed.
- A tendering process is envisaged.
- Linkages of coal development in Botswana and infrastructure (rail, power stations, coal-to-liquids plants, etc) development shall be established.
- A dedicated, independent task force to manage the coal development process will be put in place to:
  - Ensure the optimal adherence to the conditions under which PL's are granted to ensure they explicitly meet the minimum levels of exploration

# ***Way forward***

- In the next two years it will be necessary to commit to the construction of a rail and port solution to facilitate Botswana's exports and government should be actively involved in supporting the decision making process and the beginning of implementation.
- Clarity on the role of IPPs within the SAPP and those supplying power to South Africa will be required to give confidence to IPPs that power generated will be able to be sold, even if it is not possible to get long-term PPAs for the majority of the power that will be generated.
- As the understanding of the coal resource develops, it will be necessary to build a “**geological model**” of Botswana's coal resources to fully understand the potential of the resource.
- Beyond this, an integrated economic model should be developed to be able to model the impact of policy decisions on the economic environment.

# Contacts



## **Ministry of Minerals, Energy and Water Resources**

P/Bag 0018

Gaborone, Botswana

Tel: +267-365-6600

Fax: +267-370-9368

Emails:

[bpaya@gov.bw](mailto:bpaya@gov.bw)

[kmaswabi@gov.bw](mailto:kmaswabi@gov.bw)